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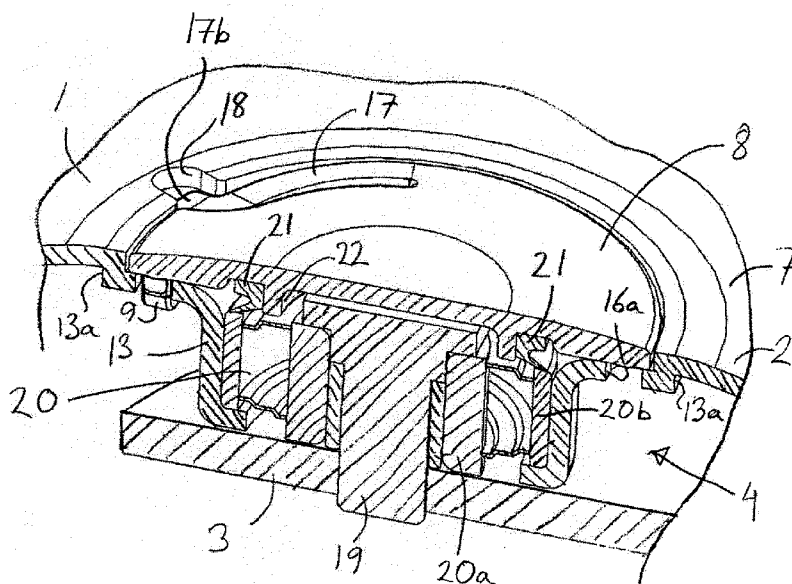
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(54) Title: A DISC ASSEMBLY FOR AN AGRICULTURAL MACHINE, AS WELL AS A CAP AND A DISC MEMBER OF SUCH A DISC ASSEMBLY



(57) Abstract: The invention relates to a disc assembly (1) for an agricultural machine, comprising a disc member (7) and a cap (8), which disc member (2) includes a disc (2), as well as a disc member (7) and a cap (8) of such a disc assembly (1). The disc assembly (1) is characterized in that the cap (8) is provided with at least one engagement member (9) and the disc member (7) is provided with at least one engagement member (16), which engagement members (9, 16) are arranged to be in engagement with each other in a mounted position of the cap (8) on the disc member (7), the disc assembly (1) having a locking device (17, 18) that is arranged to assume, in the mounted position of the cap, a locking position so as for the cap (8) to be locked in relation to the disc member (7).

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A DISC ASSEMBLY FOR AN AGRICULTURAL MACHINE, AS WELL AS A CAP
AND A DISC MEMBER OF SUCH A DISC ASSEMBLY

TECHNICAL FIELD

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The present invention relates to a disc assembly for an agricultural machine, comprising a disc member and a cap, which disc member includes a disc for cultivation, as well as a disc member and a cap of such a disc assembly.

10 BACKGROUND

Several types of agricultural machines are provided with rows of mainly vertically oriented discs, which upon usage are in contact with the ground in order to cultivate the soil. US4519325 shows a special application in a sowing machine where the discs are arranged in pairs, each one of which forming a so-called "V-disc", i.e., two discs arranged in a V-shape that opens a sowing furrow in which seed is placed. A known variant of disc for agricultural machines has, in the central portion thereof, an opening for access when mounting and dismounting the disc. In the mounted state of the disc on an arm via a bearing mounting, a cap is provided in order to cover the opening of the disc to avoid that soil, dust and the like penetrates into the bearing mounting. Said cap, which may be made as a bolted or riveted capsule of metal, or of injection-moulded plastic, retained in place by tightening force, friction, clamping force or by means of a plurality of snap members arranged at a distance from the rotation axis of the disc.

25 In agricultural work, a simple and quick handling of the machines used is required. In the known solutions, this need is not met. In practical agricultural work, riveted caps cannot at all be removed when dismounting the disc. Other solutions, including bolted caps or caps of injection-moulded plastic, often require specially adapted tools for the removal of the caps. In many situations, particularly out in the fields and the like, access to special

tools is limited. In solutions with snap members or the like, for the removal of the cap, the user is, when special tools are lacking, often obliged to use a tool having a slender end that is pressed in between the cap and the disc at the periphery of the cap. Upon such manipulations, the cap is often damaged and has to be replaced.

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SUMMARY

An object of the invention is to prolong the service life of the parts included in disc assemblies of the type mentioned by way of introduction.

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An additional object of the invention is to improve the reliability in the protection of bearing mountings for discs of agricultural machines.

Yet an object of the invention is to provide a solution, for the protection of bearing
15 mountings for discs of agricultural machines, that is space-saving.

An additional object of the invention is to allow a simple and time-efficient management when mounting and dismounting discs of agricultural machines.

20 Said objects are attained by a disc assembly of the type mentioned by way of introduction, which is characterized in that the cap is provided with at least one engagement member and the disc member is provided with at least one engagement member, which engagement members are arranged to be in engagement with each other in a mounted position of the cap on the disc member, the disc assembly having a locking device that is
25 arranged to assume, in the mounted position of the cap, a locking position so as for the cap to be locked in relation to the disc member.

By means of the locking device, the cap can be efficiently locked to the disc member. The arrangement of such a locking device separate from the engagement member(s) makes it

possible to remove the cap by means of a simple manipulation of the locking device, without contact with the engagement member(s) or the rest of the cap. Thereby, the risk decreases of some part of the cap, inclusive of the engagement member(s), being damaged upon dismounting. This represents a great advantage in agricultural work where simple and quick handling of the machines used often is required, and access to special tools is limited in many situations. Thus, in agricultural machines, the cap at the disc unit can easily be removed without being damaged. This allows the cap to be re-used several times, which decreases the costs when using agricultural machines having disc assemblies of the type mentioned by way of introduction.

Preferably, the disc member includes a hub flange having said at least one engagement member. Thus, one of the engagement members for the mounting of the cap may be provided on a hub flange belonging to a hub shell included in a hub for the clamping of the disc. This allows the dimensions of the cap to be kept relatively small and be limited to an area of the extension of the hub parts.

Preferably, one of a first one and a second one of the engagement members is comprised by the cap and the other one of the first and second engagement member is comprised by the disc member, the first engagement member comprising an end portion, an engagement gap being formed between the end portion and a surface adjacent to the first engagement member, the second engagement member being arranged to be at least partly situated in the engagement gap in the mounted position of the cap. In that connection, the engagement members may be arranged so that they come into engagement with each other upon a mounting motion of the cap that is mainly parallel to a disc plane corresponding to a plane of the principal extension of the disc. This allows a simple and easy-to-use arrangement for an effective prevention of the motion of the cap transverse to the disc plane.

Preferably, the second engagement member includes an area at an edge of an engagement cavity in the cap or the disc member. This allows the second engagement member to be formed extraordinarily easily in the production by the formation of a simple hole or the like.

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Preferably, the cap is arranged to assume, at mounting, a transition position in which the second engagement member, in a direction perpendicular to the disc plane, is on a level with the engagement gap. Thereby, the cap is adapted to a simple use at mounting including mainly two motions, one of the motions, into the transition position, being
10 bringing the cap into abutment against the disc member so that the engagement members are on correct level with each other, and the other motion being a displacement or a rotation of the cap in the disc plane while abutting against the disc member, so that the engagement members engage each other and the cap is clamped against the disc member. The last motion requires that the cap is arranged to move mainly parallel to the disc plane,
15 from the transition position into the mounted position. Thus, a simple and easy-to-use arrangement is allowed for an effective prevention of the motion of the cap transverse to the disc plane.

Preferably, the locking device includes an elastic portion that is exhibited by one of the
20 cap and the disc member, which elastic portion is arranged to assume, at the mounting of the cap and in an intermediate position of the cap, a resilient position, in which it is elastically deformed by means of contact with the other one of the cap and the disc member, besides which the elastic portion is arranged to assume, in the locking position of the locking device, a blocking position, in which it is not deformed or less deformed
25 than in the resilient position. This imparts the locking device a very simple, reliable and robust design.

Preferably, the locking device includes a locking cavity that is exhibited by the other one of the cap and the disc member, which locking cavity is arranged to receive, in the

mounted position of the cap, at least a part of the elastic portion. This allows said part of the locking device to be formed extraordinarily easily in the production by the formation of a simple hole, countersink, or the like, which furthermore provides a reliable locking function.

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Preferably, the transition position of the cap corresponds to the intermediate position thereof. This means that the elastic portion of the locking device assumes a resilient position approximately at the same time as the engagement members are on a level with each other, after which the engagement members, by virtue of the motion of the cap in the disc plane, engage each other approximately at the same time as the locking device assumes the locking position thereof. Thus, in a simple mounting measure, there are obtained, on one hand, a clamping state by virtue of the engagement members, and on the other hand a locking in the clamping state by virtue of the locking device.

15 The objects mentioned above are attained also by a cap according to any one of claims 10–17.

The objects mentioned above are attained also by a disc member according to any one of claims 18–20.

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DESCRIPTION OF FIGURES

The invention will be described in more detail below, reference being made to the drawings, in which

- 25 - Fig. 1 shows a side view of a disc unit for an agricultural machine,
- Fig. 2 shows a perspective view obliquely from above of a disc assembly according to a preferred embodiment of the invention,
- Fig. 3 shows a perspective view obliquely from below of a cap of the disc assembly in Fig. 2,

- Fig. 4 shows a perspective view obliquely from above of a disc member of the disc assembly in Fig. 2,
 - Fig. 5 shows a perspective view of a sectioned portion of a disc assembly according to an alternative embodiment of the invention,
 - 5 - Fig. 6 shows a perspective view of a cross-section of the disc unit in Fig. 1, with the section made along the line VI–VI in Fig. 1,
 - Fig. 7 shows a schematic cross-section of two parts of a disc assembly according to an additional alternative embodiment of the invention,
 - Fig. 8 shows a schematic perspective view of two parts of a disc assembly according to yet an alternative embodiment of the invention,
 - 10 - Figs. 9 and 10 schematically show top views of caps of disc assemblies according to additional alternative embodiments of the invention, and
 - Fig. 11 shows a partial cross-section view of a disc assembly according to an alternative embodiment of the invention, with the section made along the rotation axis of the disc.
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DETAILED DESCRIPTION

Fig. 1 shows a side view of a disc unit T for an agricultural machine, including a disc assembly 1 having a disc 2 intended to cultivate soil. The disc 2 is mounted on an arm 3 via a hub 4, which arm 3 in turn, in a known way is mounted on a beam 5 via a clamping joint 6.

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Fig. 2 shows a perspective picture of the disc assembly 1 from a side that is opposite the side of the view in Fig. 1. The disc assembly 1 comprises a disc member 7, which in turn includes the disc 2 and is described in more detail below, as well as a cap 8 mounted in the centre of the disc 2.

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Fig. 3 shows a perspective view of the underside of the cap 8, i.e., the side that is opposite the one shown in Fig. 2, in the non-mounted state of the cap. The cap 8, manufactured from a suitable material, e.g., injection-moulded plastic, has a relatively thin and mainly circular shape. The cap 8 is furthermore provided with four first engagement members 9.

5 The first engagement members 9 are formed at an inner surface 10 of the cap 8, and each of which is provided in the form of a hook-like protuberance 9, which has an end portion 11. The end portion 11 extends mainly parallel to the inner surface 10 so that an engagement gap 12 is formed between the end portion 11 and the inner surface 10.

10 Fig. 4 shows the disc member 7 when the cap 8 is not mounted. The disc 2 may be flat, but is, in this example, slightly cone- or cup-shaped. However, it has a relatively small extension in the direction of the rotation axis thereof. Here, a plane of the principal extension of the disc 2 is designated as disc plane, to which the rotation axis of the disc accordingly is a normal. The disc 2 is made of a relatively hard metal in order to be well adapted to severe stresses upon cultivation. The disc 2 has an opening in the centre
15 thereof, at which a hub shell 13 concentric with the disc 2 is fixedly connected to the disc 2. More precisely, the hub shell 13 comprises a hub flange 14, which at the periphery thereof (not visible in Fig. 4) is welded to the disc 2. The hub shell 13, which is adapted to accommodate, as is described in more detail below, a mounting-bearing device, has a
20 relatively large extension parallel to the rotation axis of the disc and is made of an unhardened metal in order to be easy to produce. Separate manufacture of the disc 2 and the hub shell 13 accompanied by the welding together thereof, accordingly allows to select different material types, adapted to their individual needs, for said elements 2, 13. Alternatively, the disc 2 and the hub shell 13 may be joined in some other suitable way,
25 e.g., by means of a screw joint. The manufacture of the hub shell 13 from unhardened metal has furthermore the advantage that it allows a certain flexibility and resilience. This prevents crack formations that are caused by external forces and usually occur in hub shells of relatively hard metals. Such external forces usually originate from the ground.

The disc member 7 presents, by the position of the hub flange 14 and the opening of the disc, a mainly circular countersunk portion 15, which extends circularly around a central hole in the disc member, and which is arranged to receive the cap 8. The depth of the countersunk portion 15 substantially corresponds to the thickness of the cap 8. Thereby, it is achieved that the outer surface of the cap, in the mounted state of the cap, is on substantially the same level as the corresponding surface of the disc 2, whereby the cap 8 does not exhibit any protruding part that may cause the cap to be damaged or removed when using the disc assembly 1.

As can be seen in Fig. 4, four second engagement members 16 are formed by means of engagement cavities 16a, in this example in the form of through holes, provided in the hub flange 13. More precisely, each one of the second engagement members 16 includes an area at an edge of one of the engagement cavities 16a. Alternatively, the engagement cavities 16a may be formed as non-through depressions. In a mounted position of the cap 8 on the disc member 7, the first and the second engagement members 9, 16 are arranged to be in engagement with each other. In that connection, each one of the second engagement members 16 is at least partly situated in the engagement gap 12, so that the motion of the cap 8 transverse to the disc plane is prevented.

As can be seen in Fig. 2, the disc assembly 1 has a locking device 17, 18 that, in the mounted position of the cap 8, is arranged to assume a locking position for the cap in relation to the disc member 7. The locking device includes an elastic portion 17, or resilient portion, exhibited by the cap 8, and a locking cavity 18 that is exhibited by the disc member 7 and that, in the mounted position of the cap, is arranged to receive a part of the elastic portion 17.

As can be seen in Fig. 3, the elastic portion 17 is provided at the periphery of the cap 8 as an elongate, deflected protuberance 17 having an outer edge 17a that in a plane of the principal extension of the cap connects to the mainly circular periphery of the cap 8.

However, an end portion 17b of the elastic portion 17 extends at least partly outside the circular line defined by the periphery of the cap 8. The elastic portion 17 is furthermore slightly angled in a direction perpendicular to the plane of the principal extension of the cap. More precisely, the elastic portion 17 is angled in the direction that in the mounted
5 state of the cap 8 is turned toward the hub flange 13.

At mounting, the cap 8 is placed in a transition position, in which it is inserted into the circular countersunk portion 15 in the disc member 7, and the first engagement members 9 are inserted into the respective engagement cavities 16a. For this purpose, the mainly
10 circular periphery of the cap 8 has a radius that is suitably adapted to the radius of the circular countersunk portion 15, so that a guiding of the cap 8, substantially concentric with the disc 2, is obtained by the countersunk portion 15 while the cap 8 can be rotated in the countersunk portion 15 without substantial friction arising between the periphery of the cap 8 and the periphery of the countersunk portion 15.

15 In the transition position, the second engagement members 16, in a direction perpendicular to the disc plane, are on a level with the respective engagement gap 12 defined by the first engagement member 9. Upon rotation of the cap in the disc plane, i.e., in the countersunk portion 15, from the transition position into the mounted position, the respective
20 pairs of first and second engagement members 9, 16 move into engagement with each other, i.e., the engagement gaps 12 receive the respective second engagement members 16.

At the mounting, the cap 8 assumes an intermediate position, which in this embodiment is
25 the same as the transition position, in which the elastic portion 17, by means of contact with the disc member 7, assumes a resilient position, in which it is deformed. More precisely, upon the insertion of the cap 8 into the countersunk portion 15, the elastic portion 17 is deflected by the contact of the end portion 17b with the disc member 7 outside the countersunk portion 15. When the cap 8 then is rotated toward the final mounted position,

the elastic portion 17 assumes, by the fact that the end portion thereof, by spring action (i.e., by means of release of elastic energy stored in the deformed position), is inserted into the locking cavity 18, a blocking position, in which it is not deformed or less deformed than in the resilient position.

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The elastic portion 17 may be formed integrally together with the other parts of the cap 8 inclusive of the engagement members 9, which imparts the cap a very simple and functional design. Preferably, the cap including the elastic portion and the engagement members are made of injection-moulded plastic. Alternatively, the cap including said parts may be made in another manner, e.g., of a punched metal sheet.

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Here, reference is made to Fig. 5. As an alternative, the disc member 7 may be provided with a rounded protuberance 18' and at the end portion 17b thereof, the elastic portion 17 may have a blocking cavity 17a', the elastic portion 17 assuming a resilient position at the mounting of the cap by virtue of the contact of the end portion 17b with the protuberance 18'. When the cap 8 is rotated to the final mounted position, then the elastic portion 17, by the fact that the protuberance 18', via the spring action of the elastic portion 17, is inserted into the blocking cavity 17a', assumes a blocking position, in which it is not deformed or less deformed than in the resilient position. In such an embodiment, the intermediate position, in which the elastic portion 17 assumes the resilient position, may differ from the transition position, in which the engagement members 9, 16, in a direction perpendicular to the disc plane, are on a level with each other but yet not in engagement with each other.

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In Fig. 6, a perspective view is shown of a cross-section along the line VI-VI in Fig. 1 of the disc assembly 1 mounted to an arm 3 via a hub 4. In this embodiment, as mentioned, the disc assembly 1 comprises the cap 8 and the disc device 7, in turn comprising the hub shell 13 included in the hub 4 and, as mentioned, attached to the disc 2 by means of a welding seam 13a in the periphery of the hub shell 13. A bolt 19, concentric with the

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rotation axis of the disc 2, is screwed against the arm 3 and than holds an inner race 20a of a mounting-bearing device 20, in the form of a ball bearing, which also comprises an outer race 20b as well as bearing balls (not shown) situated between the races. The hub shell 13 is attached to the outer race 20b.

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The cap 8 is provided with a ring-shaped sealing member in the form of a V-ring 21, which is kept in place by being fitted slightly extended around a ring-shaped shoulder on the inside of the cap 8. The sealing member 21 may advantageously be premounted to the cap 8 for easy handling when mounting the cap 8. Such a premounting may considerably
10 simplify the handling for the user. Since the discs 2 in agricultural machines are substantially vertically orientated, sealing rings provided separately will impose problems for the user in that the same has to keep the sealing ring in place in a vertical position at the same time as the cap is mounted. In this embodiment, the sealing member, i.e., the V-ring 21, in the mounted state of the cap 8, abuts against the outer race 20b by a lip, which makes that
15 the sealing member 21 will be worn minimally. The sealing member 21 provides an efficient seal that protects against penetration of dirt and dust into the hub 4. The V-ring-seal solution is furthermore space-saving, which contributes to the fact that the cap 8 can be made thin. Thereby, the possibilities increase to design a cap 8 that does not project outside the delimitation surface of the disc 2, and accordingly the risk that the cap will be
20 damaged or torn away during use can be minimized. Alternatively, an O-ring or another type of sealing member 21 may be used.

Transverse to the disc plane, the locking cavity 18 has a greater extension than the end portion 17b of the elastic portion 17. This allows the cap 8 to be easily detached without
25 being damaged by placing the end of an elongate tool between the end portion 17b and an edge of the locking cavity 18, and using the same, with support against the edge of the locking cavity, to bend up the elastic portion 17 so that the end portion 17b is brought out of the locking cavity 18, the elastic portion 17 being brought out of the blocking position, after which the cap can be rotated in the disc plane so that the engagement members 9, 16

leave the mutual engagements and the cap 8 can be removed from the countersunk portion 15 in the disc member 7.

A large number of alternative embodiments are feasible. As an example, the first engagement members 9 as described above, i.e., the protuberances 9, may be formed on the disc member 7, and engagement cavities 16a of the second engagement members 16 may be formed on the cap 8. Alternatively, as is shown schematically in Fig. 7, the engagement members on both the cap 8 and the disc member 7 may be formed as protuberances of the type described above, pairs of protuberances being arranged to come into engagement with each other. As an additional alternative, as is shown schematically in Fig. 8, the second engagement members 16 formed of the engagement cavities 16a may be replaced by loops 16. In an additional alternative, schematically shown in Figs. 9 and 10, the protuberances 9 may be provided on the periphery of the cap 8, instead of on the inside thereof, the engagement members of the disc member being complementary arranged in a suitable form, e.g., as loops shown in Fig. 8. Irrespective of the design of the engagement members, the pairs of the same may be more than four or only one, two or three in number.

Furthermore, in yet an alternative, the elastic portion 17 described above may be provided on the disc member 7 and the locking cavity 18 described above may be formed on the cap 8. An additional alternative for the locking device has been described above, reference being made to Fig. 5.

In the embodiment example described with reference to Figs. 1–4, the disc member 7 comprises a disc 2 and a hub shell 13. Alternatively, as is shown schematically in Fig. 11, the disc member 7 may have a disc 2, which in turn has the engagement cavities 16a of the second engagement members 16. Thus, the disc 2 may have all members requisite for the clamping and locking of the cap 8.

The invention may, due to the small space requirement thereof, advantageously be applied to sowing machines having V-disc where the available space for the disc members often is limited, even if also other application areas of course are feasible.

CLAIMS

1. A disc assembly (1) for an agricultural machine, comprising a disc member (7) and a cap (8), which disc member (7) includes a disc (2), **characterized in** that the cap (8) is provided with at least one engagement member (9) and the disc member (7) is provided with at least one engagement member (16), which engagement members (9, 16) are arranged to be in engagement with each other in a mounted position of the cap (8) on the disc member (7), the disc assembly (1) having a locking device (17, 18) that is arranged to assume, in the mounted position of the cap, a locking position so as for the cap (8) to be locked in relation to the disc member (7).
2. A disc assembly according to claim 1, the disc member (7) including a hub flange (14) having said at least one engagement member (16).
3. A disc assembly according to any one of the preceding claims, one of a first one (9) and a second one (16) of the engagement members being comprised by the cap (8) and the other one of the first (9) and second (16) engagement member being comprised by the disc member (7), the first engagement member (9) comprising an end portion (11), an engagement gap (12) being formed between the end portion (11) and a surface (10) adjacent to the first engagement member (9), the second engagement member (16) being arranged to be at least partly situated in the engagement gap (12) in the mounted position of the cap.
4. A disc assembly according to claim 3, the second engagement member (16) including an area at an edge of an engagement cavity (16a) in the cap (8) or the disc member (7).

5. A disc assembly according to claim 3 or 4, the cap (8) being arranged to assume, at mounting, a transition position in which the second engagement member (16), in a direction perpendicular to a disc plane corresponding to a plane of the principal extension of the disc (2), is on a level with the engagement gap (12).

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6. A disc assembly according to claim 5, the cap (8) being arranged to move mainly parallel to the disc plane, from the transition position into the mounted position.

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7. A disc assembly according to any one of the preceding claims, the locking device (17, 18) including an elastic portion (17) that is exhibited by one of the cap (8) and the disc member (7), which elastic portion (17) is arranged to assume, at the mounting of the cap (8) and in an intermediate position of the cap (8), a resilient position, in which it is elastically deformed by means of contact with the other one of the cap (8) and the disc member (7), besides which the elastic portion (17) is arranged to assume, in the locking position of the locking device (17, 18), a blocking position, in which it is not deformed or less deformed than in the resilient position.

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8. A disc assembly according to claim 7, the locking device including a locking cavity (18) that is exhibited by the other one of the cap (8) and the disc member (7), which locking cavity (18) is arranged to receive, in the mounted position of the cap, at least a part of the elastic portion (17).

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9. A disc assembly according to claim 7 or 8 depending on claim 5 or 6, the transition position of the cap (8) corresponding the intermediate position thereof.

10. A cap of a disc assembly (1) according to any one of claims 1–9, **characterized in** that the cap (8) is provided with at least one first engagement member (9), each of which is arranged to be, in a mounted position of the cap (8) on a disc

member (7), in engagement with one of at least one second engagement member (16) exhibited by the disc member, besides which the cap has at least one part (17) of a locking device (17, 18) that is arranged to assume, in the mounted position of the cap, a locking position so as for the cap (8) to be locked in relation to the disc member (7).

11. A cap according to claim 10, said at least one first engagement member (9) of the cap (8) comprising an end portion (11), an engagement gap (12) being formed between the end portion (11) and a surface (10) adjacent to the respective first engagement member (9), the engagement gap (12) being arranged to receive, in the mounted position of the cap, at least a part of a respective of the at least one second engagement member (16) of the disc member (7).

12. A cap according to claim 11, the engagement gap (12) being arranged to receive, in the mounted position of the cap, an area at an edge of an engagement cavity (16a) in the disc member (7).

13. A cap according to claim 11 or 12, that is arranged to assume, at mounting, a transition position in which the second engagement member (16), in a direction perpendicular to a disc plane corresponding to a plane of the principal extension of the disc (2), is on a level with the engagement gap (12).

14. A cap according to claim 13, arranged to move mainly parallel to the disc plane, from the transition position into the mounted position.

15. A cap according to any one of claims 10–14, the locking device (17, 18) including an elastic portion (17) that is exhibited by the cap (8), which elastic portion (17) is arranged to assume, at the mounting of the cap (8) and in an intermediate position of the cap (8), a resilient position, in which it is elastically

deformed by means of contact with the disc member (7), besides which the elastic portion (17) is arranged to assume, in the locking position of the locking device (17, 18), a blocking position, in which it is not deformed or less deformed than in the resilient position.

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16. A cap according to claim 15, the elastic portion (17) being arranged to be, in the blocking position, at least partly situated in a locking cavity (18) exhibited by the disc member (7).

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17. A cap according to claim 16, the transition position of the cap (8) corresponding to the intermediate position thereof.

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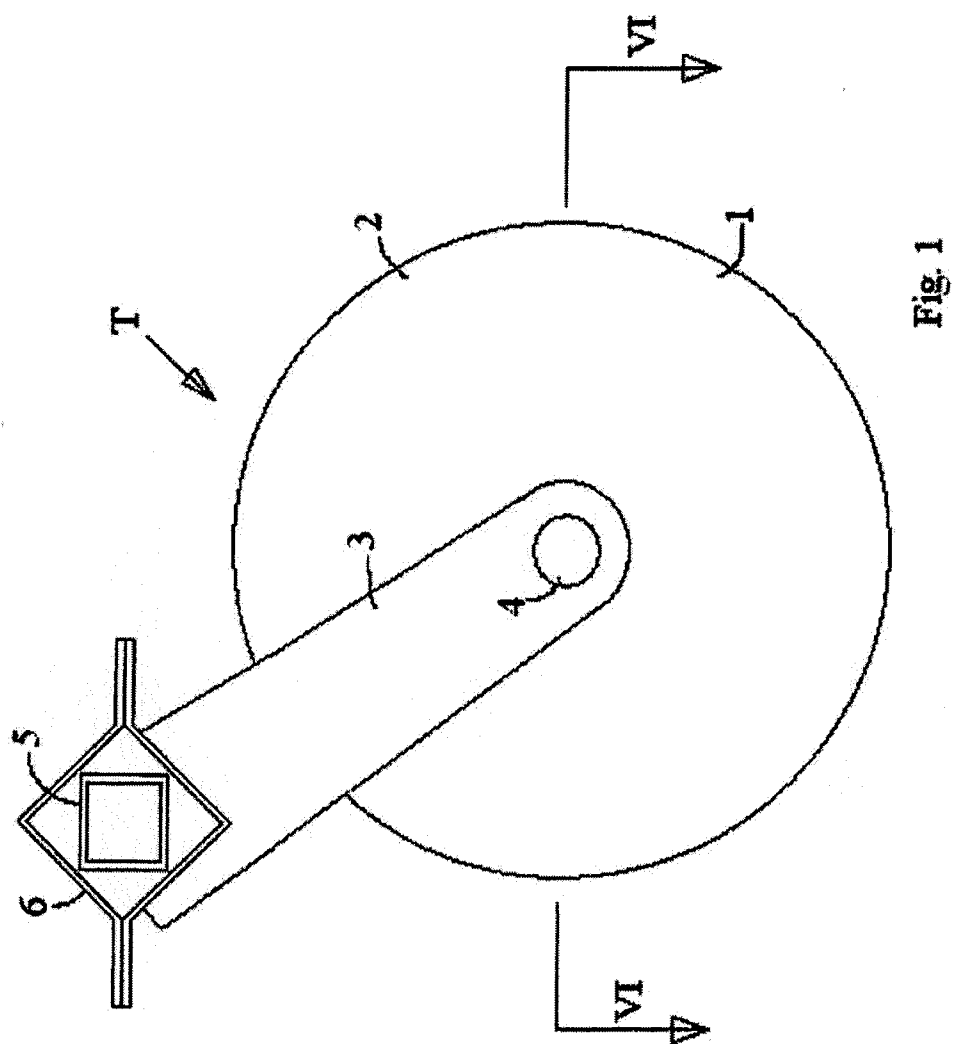
18. A disc member (7) of a disc assembly (1) according to any one of claims 1–9, **characterized in** that the disc member is provided with at least one engagement member (16), each of which is arranged to be, in a mounted position of a cap (8) on the disc member (7), in engagement with one of at least one engagement member (9) exhibited by the cap (8), besides which the disc member (7) has at least one part (18) of a locking device (17, 18) that is arranged to assume, in the mounted position of the cap, a locking position so as for the cap (8) to be locked in relation to the disc member (7).

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19. A disc member (7) according to claim 18, said at least one engagement member (16) of the disc member (7) comprising an area at an edge of an engagement cavity (16a) in the disc member (7), which area (16) is arranged to be, in the mounted state of the cap (8), at least partly situated in an engagement gap (12) formed between an end portion (11) exhibited by the respective engagement member (9) of the cap and a surface (10) adjacent to the respective engagement member (9) of the cap.

20. A disc member (7) according to any one of claims 18–19, the disc member (7) being arranged to set, at the mounting of the cap (8) and in an intermediate position of the cap (8), an elastic portion (17) exhibited by the cap in a resilient position by means of contact with the elastic portion (17), besides which the locking device (17, 18) includes a locking cavity (18) that is exhibited by the disc member (7), which locking cavity (18) is arranged to receive, in the locking position of the locking device (17, 18), at least a part of the elastic portion (17) so that the elastic portion (17) assumes a blocking position, in which it is not deformed or less deformed than in the resilient position.



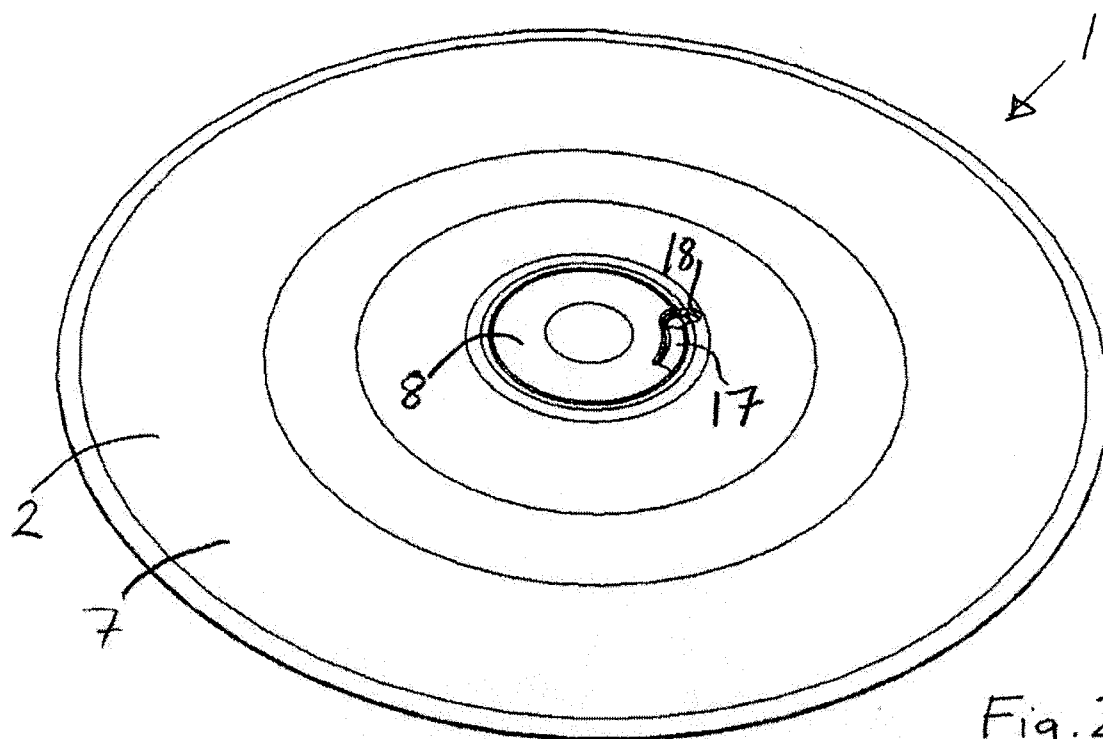


Fig. 2

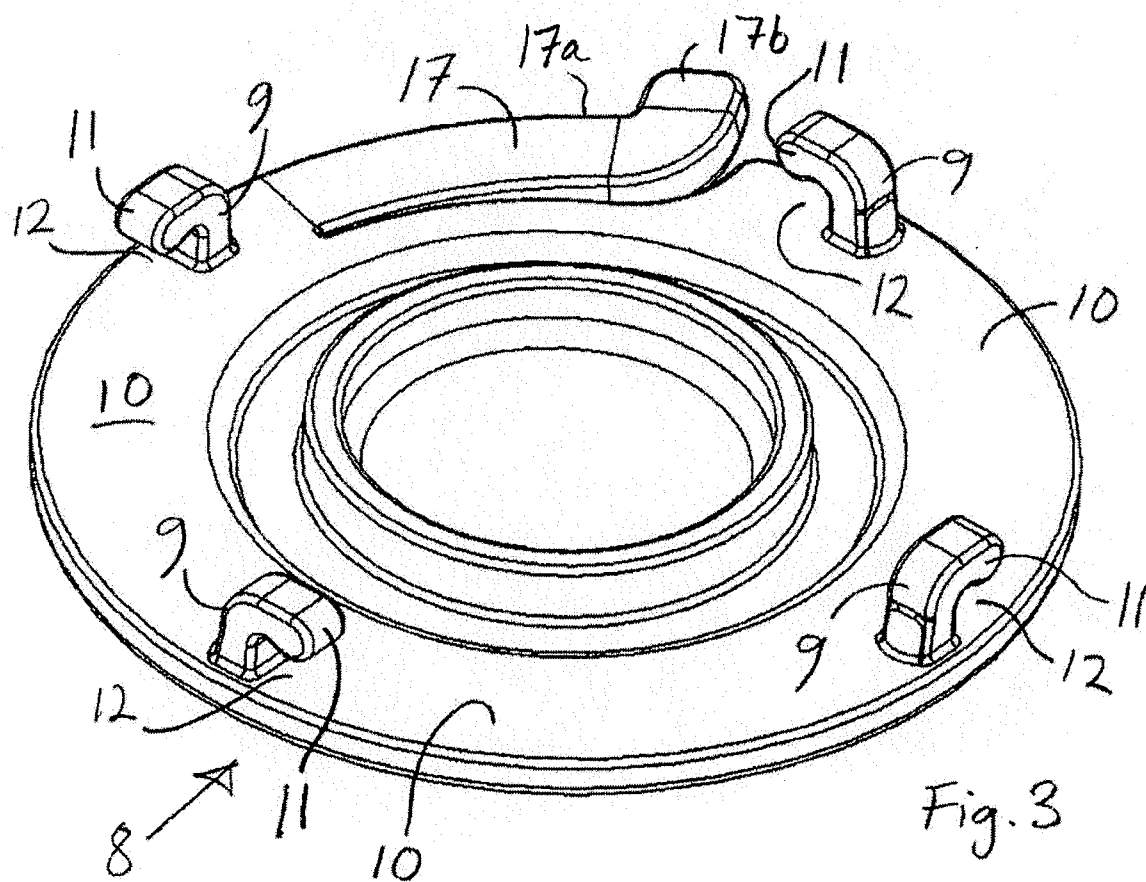
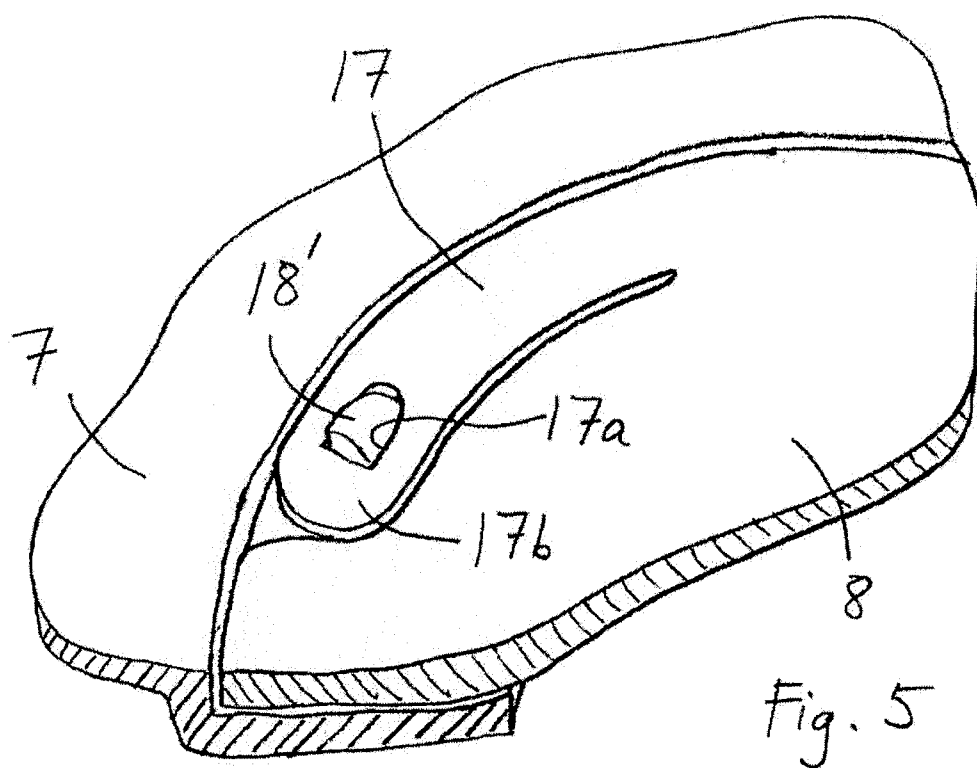
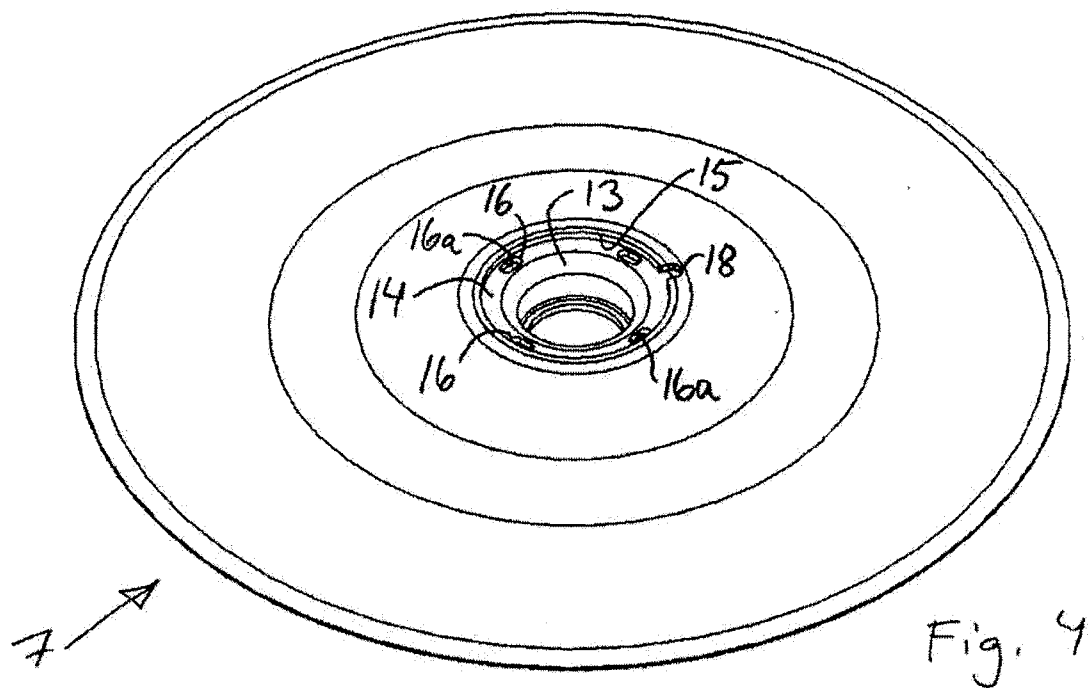


Fig. 3



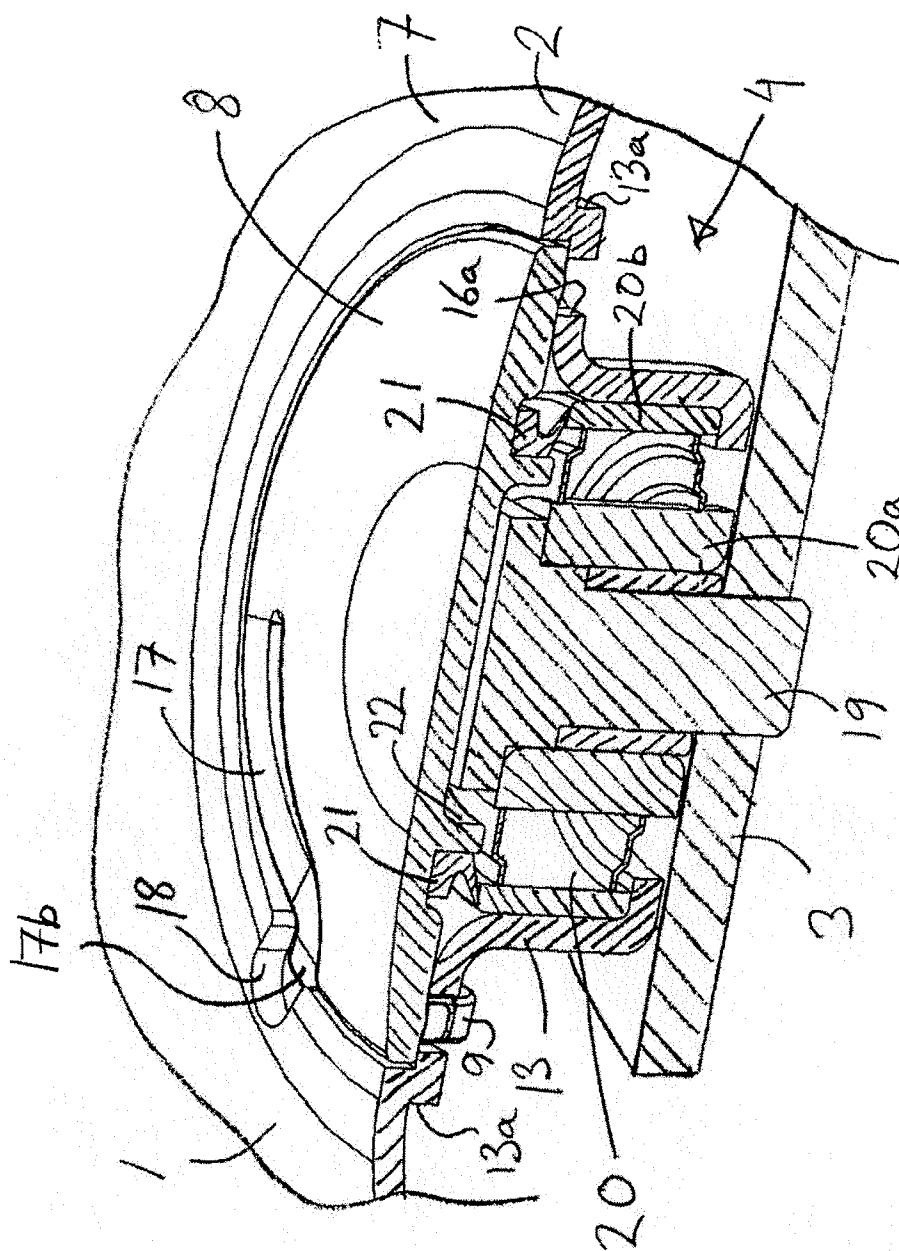


Fig. 6

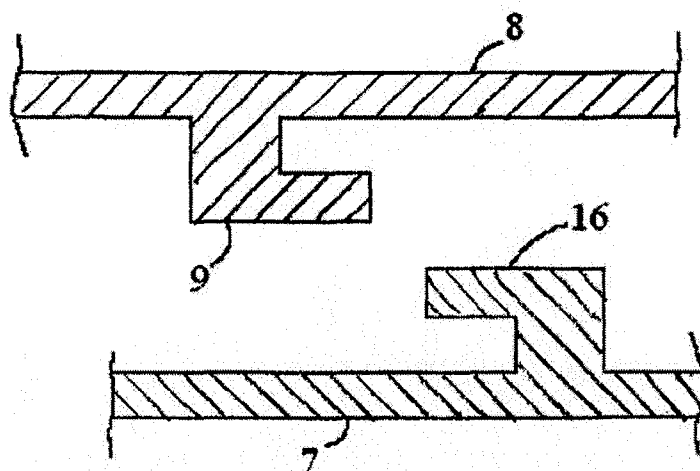


Fig. 7

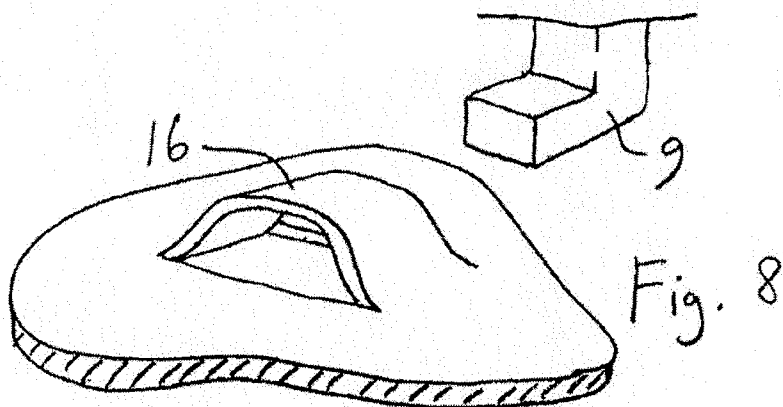
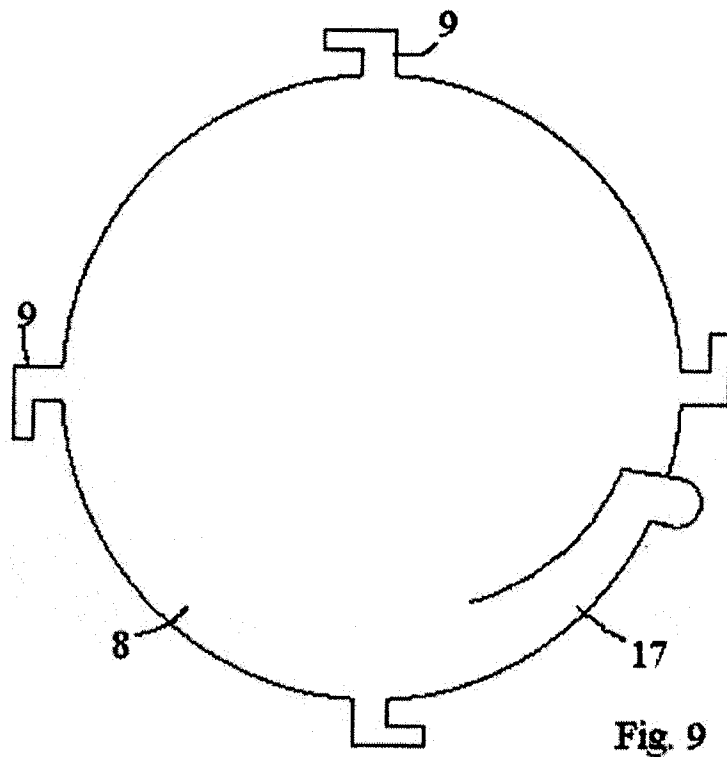


Fig. 8



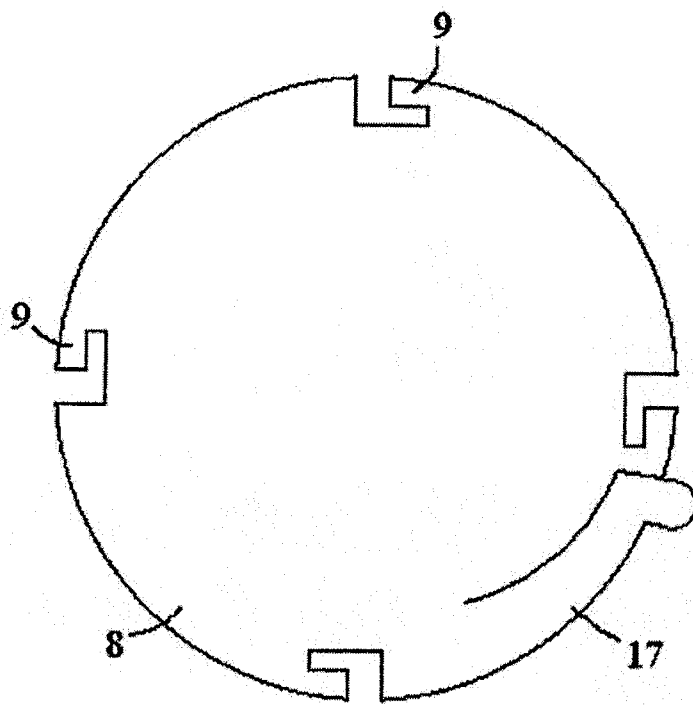


Fig. 10

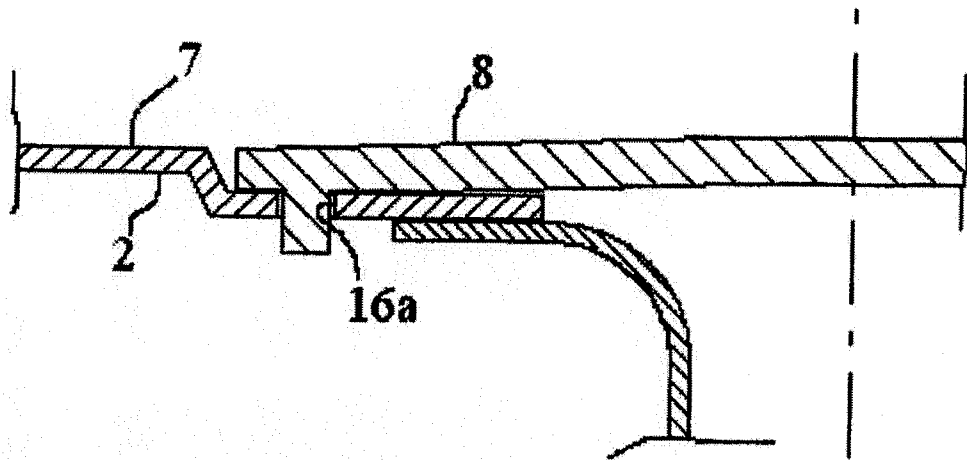


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/060543

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01B21/08 A01B71/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01C A01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 577 699 A (ROTTINGHAUS ROBERT B [US]) 25 March 1986 (1986-03-25) abstract column 2, line 38 - column 4, line 46 figures 1-3	1,2,10, 18
A		3-9, 11-17, 19,20
X	EP 0 140 699 A (DEERE & CO [US]) 8 May 1985 (1985-05-08) page 4, line 30 - page 9, line 16 figures 1-8	1,2,10, 18
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

12 December 2007

Date of mailing of the international search report

27/12/2007

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Authorized officer

Espeel, Els

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/060543

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	GB 235 018 A (CHARLES ELLERBY) 11 June 1925 (1925-06-11) page 2, line 46 - line 52 figure 1 -----	1,10,18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2007/060543

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